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Risk, Entitlements and Fairness Bias:

Explaining Preferences for Redistribution in Multi-person Setting*

Mitesh Kataria†

Natalia Montinari‡

Abstract

Researchers frequently studied the casual relationships of other-regarding preferences by applying experimental methods in bilateral settings (e.g., dictator game and ultimatum game). We use a framed experiment on taxes to study preferences for redistribution in a multi-person setting. We find presence of heterogeneous preferences with a substantial share of tax rate choices in line with both payoff maximization and other-regarding preferences. Notably, our data is not consistent with inequality aversion but points to other forms of other-regarding preferences, as fairness and altruism. By manipulating how subjects are assigned to a given level of pre-tax income, we vary the individual entitlements. We find a difference in the willingness to redistribute income when comparing the treatment where pre-tax income is assigned by relative performance in a production task (a general knowledge quiz) to the treatment where pre-tax income is assigned by luck. We do not find any significant difference in comparison to the intermediate treatment where pre-tax income is assigned by a combination of luck and performance. The perception of a "fair" tax is different depending on whether subjects' pre-tax income is below or above average, which is in line with a fairness bias. Finally, subjects not knowing whether their pre-tax income is below or above the average when choosing the tax rate behave as if they were more other-regarding.

Keywords: Redistribution, Entitlements, Fairness Bias, Risk, Framed Tax Experiment

JEL classification: D6, C9

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1. Introduction

In many situations, success is partly earned and partly a result of luck. From early age there exist unequal opportunities between people within as well as between societies, which is caused by luck rather than merit. While some of us have the luck to be born with many opportunities, others do not have such luck. For example, while some of us are born with good looks, others are not; while some are born early in the year, others are born late; and while some are born rich, others are born poor. These are some of the factors that have been shown to affect success in working life and can be linked to luck: e.g., attractive people earn more than unattractive people Hamermesh and Biddle (1994); the date of birth seems to affect educational and labor market outcomes Crawford et al., (2007); and the wage gap in the U.S. labor market is explained by ethnicity and race through different access to education Carneiro et al. (2005). In specific situations, social norms prescribe to equalize unearned advantages. For example, in a "life-and-death" situation a social norm says that physically weaker individuals, such as women and children, have to be saved first e.g., Frey et al. (2011). In other situations, the law requires affirmative action in favor of discriminated minorities Kahlenberg (1997). However, in many situations in which success results from a combination of luck and effort, it is less clear how to deal with unearned advantages. Income redistribution is a case in point. In the literature of social justice, different views about redistribution are based on conflicting normative theories on how to deal with inequalities. For example, according to Rawls' "max-min" principle, those individuals who are least well off in society should be favored by redistribution irrespective of the cause of their poverty Rawls (1971). A taxation system inspired by Rawls' theory of justice implies the principle of the ability to pay tax and has led to the widely held view that the amount of tax someone pays should increase with income. By contrast, according to the formulations of entitlement theory based on the productivity principle, each individual has the right to that which he produces, and redistribution is something unwarranted and unjust. A taxation system inspired by entitlement theory based on the productivity principle applies the benefit principle of taxation: those individuals that benefit more should pay more tax. A relatively recent definition of entitlements is based on the accountability principle which

combines the equity theory Adams, 1964, according to which fair outcomes are proportional to contributions, and attribution theory Heider (1958), according to which, in evaluating contributions to outcomes, individuals are only held responsible for factors they can control. This formulation of entitlements requires that a person's fair allocation (e.g., of income) vary in proportion to the relevant variables that he can influence (e.g., work effort) but not according to those variables that he cannot reasonably influence (e.g., a physical handicap) Konow (1996; 2000). The accountability principle has previously been tested almost exclusively in bilateral settings.

Our experimental inquiry analyzes a situation where competing principles may be applied to justify income redistribution in multi-person settings. Does the knowledge that material success, namely income, is partly attributed to luck make people less self-regarding? We address this question using a framed redistribution tax experiment where redistribution takes place among several individuals resembling a society. We also investigate if people entertain biased beliefs about fair allocations and if preferences for income redistribution changes depending on the fact that people know whether they will or will not benefit from the presence of unequal opportunities.

Decisions on redistribution both in terms of redistributive policies and other forms of government intervention, (e.g., social insurance) are among the features which characterize a society.[1] In democracies individuals typically do not vote directly on a tax rate. Instead, they hold redistribution preferences which, by means of aggregation mechanisms, are transformed into the choice of a candidate or political parties supporting specific redistributive policies. When observing such preferences, we note that several factors act simultaneously, i.e., at the individual level (e.g., education, ideology, beliefs about the fairness of social competition, etc.) and at the contextual level (e.g., the deadweight loss associated to taxation; the structure of the income classes; and the role of luck compared to the role of effort in determining individual success, etc.). Considering

[1] For example, culture differences in the U.S. and Europe emphasize the relative merits of equality versus individualism very differently, which could, in turn, affect norms about an acceptable level of inequalities Alesina and Glaeser, (2004). At the aggregate level, it has been shown that differences in social sharing behavior across societies can be explained by different beliefs about the cause of poverty, i.e., whether it is bad luck or lack of effort that caused unsuccessful outcomes; see Biel et al. (2011), Alesina and Angeletos (2005), Alesina and La Ferrara (2005).

this complexity, laboratory experiments appear to be a suitable means for the study of individual redistribution preferences since they allow controlling for factors which cannot be easily controlled nor varied when dealing with other data.

The bargaining literature on dictator and ultimatum games e.g., (Forsythe et *al.*, 1994; Güth, et *al.*, 2002) evidences that individuals exhibit other-regarding preference. However, it is not clear how these behaviors relate to redistribution preferences in larger groups of people and when a tax frame is adopted. A redistributive tax is not directly comparable to a transfer made voluntarily by one individual to benefit another as in a dictator or ultimatum game; once implemented, it affects all members of a society. Consequently, some of them will gain while others will lose after the introduction of the tax, which is vastly different from the experimental setting used in the bargaining literature (e.g., dictator game, ultimatum game) where relationships are typically bilateral or limited to small groups. As far as we know, only a few studies have investigated individual preferences for redistributive taxation using a framed tax experiment and groups with more than two members Froehlich and Oppenheimer (2000); Ackert et *al.* (2007); Esaray et *al.* (2012); and Durante and Putterman (2009). We add to this sparse literature and find evidence of heterogeneity in redistribution preferences with a substantial share of both payoff maximizers and subjects that exhibit other-regarding preferences consistent with altruism and fairness.

Our main focus is on the role of entitlements, as defined by the accountability principle, on the choice of redistribution.[2] Previous studies suggest that individual entitlements legitimate behaviors more in line with selfishness: in ultimatum games, lower offers are made and accepted more often when entitlements are induced rather than not induced Hoffman et al. (1994). Through a survey where the accountability was manipulated Konow (2001) provided evidence that for disinterested observers (i.e., individuals who do not have a "stake" affected by their decision) entitlements are based

[2] In the experiment, we vary the level of entitlements (as defined by the accountability principle) by manipulating the stochastic component that generates subjects' pre-tax income. Whether or not this affects the subjects' decision, it also depends on people's *subjective* perception of entitlements. As stated by Schlicht (1998): "the entitlements are rights, as perceived by the individual. They are not, however, abstract legal rights. Rather they denote the subjectively perceived rights that go along with a motivational disposition to defend them."

on the accountability principle. In another study, where stakeholders (i.e., individuals who have a "stake" affected by their decision) are considered, Konow (2000) found that dictators in a dictator game tend to keep more for themselves than the accountability principle would predict. This is explained by self-deception about what is fair: stakeholders adapt their view of what is fair such that it benefits their position.

As for entitlements, our results show that when pre-tax income is generated by luck, the increase in subjects' willingness to redistribute income is only slightly higher compared to when it is generated by ability. When pre-tax income is generated by a combination of both luck and ability, we do not find any significant effect on the willingness to redistribute compared to the two extreme cases in which only luck or only ability have generated pre-tax income. However, if subjects do not know whether randomly allocated opportunities lead to a favorable or unfavorable position regarding pre-tax income, distribution results in a substantial increase in their willingness to pay taxes compared to when they know that their pre-tax income is above average. Finally, we find that stakeholders that are subsequently asked to decide as impartial spectators i.e., without a stake as in Konow (2009) are subject to self-serving bias e.g., Festinger (1957); Babcock and Loewenstein (1997); Konow (2000), though only in the treatment where pre-tax income is determined by ability.

The rest of this paper is organized as follows: Section 2 reviews the literature on the topic. Section 3 presents our behavioral predictions. Section 4 presents the experimental design. Section 5 illustrates the experimental procedures. Section 6 presents and discusses our results and Section 7 concludes.

2. Literature

Our work is also closely related to the papers by Ackert et *al.* (2007), Esaray et al. (2012), and Durante and Putterman (2009). In Ackert et *al.* (2007), subjects were, in each round, randomly *endowed* with different pre-tax incomes and repeatedly given a binary choice between a lump sum head tax and a progressive tax. After controlling for risk aversion and cooperative strategy signaling, it is found that 15% 9 over 60) of the votes of high income individuals (consisting of 12 subjects) are against the payoff maximizing

lump sum head tax and in favor of the progressive tax. Ackert et *al*. (2007) conclude that individuals demonstrate concerns for their own as well as others' payoff when making their tax decision. However, the findings of this experiment may partly capture the fact that individual endowments are not earned by individual effort, which may be relevant in a study about redistribution using a tax frame. For this reason participants may, indeed, be more willing to vote in favor of a more equal redistribution as well as having concern for efficiency. Compared to Ackert et *al*. (2007), our experimental design has two strengths: i) we utilize a sample with more independent observations to make more robust inference, and ii) we investigate how entitlements to the pre-tax income affect the redistribution choices.

In Esaray et *al.* (2012), subjects earned money by exerting effort in a production task consisting of five periods. They were then given feedback about their own and other session members' average earnings and were asked to vote for a tax rate to be implemented in the subsequent three periods with a similar production task. Afterwards subjects voted again for a tax rate to be applied to the income obtained in the subsequent three periods of the production task. Voting behavior was investigated in three treatments, which differed in the entitlements norms about pre-tax income. However, no effect of the different entitlements on the tax decision was found. In all three treatments, above-average earners voted for low tax rates and below-average earners for high tax rates. Compared to Esaray et *al.* (2011), one of the strengths of our design is that our subjects vote for a tax rate once their pre-tax income is determined. Therefore, based on a punctual prediction about the tax rate choice, we can experimentally (as opposed to econometrically) disentangle self-regarding and other-regarding preferences without the influence of risk aversion.[3] Moreover, compared to Esaray et *al.*'s design, where

[3] Since, at the moment of voting, subjects do not know their pre-tax income, Esaray et *al.* (2011) expected an interior choice of a tax rate based on subjects' risk aversion. Moreover, having decided on the tax rate before the pre-tax income determination, subjects are assumed to hold beliefs about disincentives of high tax rates, and for this reason below-average pre-tax income earners would refrain from choosing the maximum tax rate.

inequality was varied with entitlements across treatments, our design has the advantage to keep inequality fixed across sessions and treatments.[4]

In Durante and Putterman (2009), subjects make their choice of redistribution under three different conditions. Under the first condition, subjects choose as disinterested observers; under the second as involved participants with uncertainty about their pre-tax income, and under the third as involved participants with certainty about their pre-tax income. Within each condition, subjects have to choose a tax rate in four different scenarios comprising a total of 12 tax rates to be chosen by each subject. The four scenarios resemble four possible methods of determining pre-tax income: 1) according to the first method, pre-tax income is determined randomly; 2) according to the second method, which focuses on the average, pre-tax income is determined according to subjects' place of origin; 3) according to the third method, pre-tax income is determined according to subjects' performance in a general knowledge quiz; and 4) for the fourth one the pre-tax income is determined according to subjects' score in a computer-based game of skill (Tetris). The authors find that most of the subjects have a preference for reducing inequality, and their demand for redistribution responds in predictable ways to the cost of taxation and to the deadweight loss associated with it. They also find that entitlements affect the choice of redistribution, especially for male subjects. Compared to the authors' experimental design, the main difference to our design lies in the decision faced by subjects. In our experiment, subjects are asked to make only one payoff-relevant decision as involved participants. Consequently, our analysis is conducted between subjects, eliminating any concern about the possible order effect of the different scenarios on the elicitation of preferences.

[4] If inequality is manipulated jointly with entitlement across treatments, it becomes impossible to understand whether individuals prefer a given tax because of entitlement manipulation or because of the change in inequality.

3. Behavioral Predictions

In this section we derive our behavioral predictions. Consider a society composed of $i = 1, 2, .., n-1, N$ individuals. Both luck and individual ability may play a role in determining individual pre-tax income. We identify luck, l, as an discrete random variable uniformly distributed while we denote individual ability as $a_i \in \left[\underline{a}, \overline{a}\right]$. Therefore, we indicate individual i's pre-tax income as $y_i^{PRE}\left(l, a_i\right) \in \left[\underline{y}, \overline{y}\right]$, with $\overline{y} > \underline{y} \geq 0$ such that, $\partial y_i^{PRE}(l, a_i) / \partial a_i > 0$ unless pre-tax income is entirely determined by luck, case in which $\partial y_i^{PRE}(l, a_i) / \partial a_i = 0$.

Once the pre-tax income is determined, subjects vote, through a median vote mechanism, on a proportional tax $\tau_i \in [0,100]$ to reduce pre-tax income inequality. When a redistributive policy is adopted (i.e. $\tau^* > 0$), the taxes raised are redistributed evenly among all members of a society, and subjects' post-tax income, y_i^{POST}, is determined as follows:

$$y_i^{POST} = (1-\tau^*) y_i^{PRE}\left(l, a_i\right) + \frac{\tau^*}{n} \sum_{i=1}^{n} y_i^{PRE}\left(l, a_i\right) \qquad (1)$$

3.1 Self-regarding motives

We define as self-regarding those voters who, in choosing their preferred tax rate, maximize their monetary payoff as stated in eq. (1). Taking the derivative of eq. (1) with respect to the tax rate, it follows that:

- If the pre-tax income of individual *i* is higher than the average pre-tax income, the post-tax income will decrease with an increase in the tax rate and the tax rate choice which maximizes the monetary payoff is 0;

- If the pre-tax income of individual *i* is lower than the average pre-tax income the post-tax income will increase with an increase in the tax rate, and the tax rate choice which maximizes the monetary payoff is 100.[5]

This implies that a higher tax rate, everything else equal, lowers the post-tax income of rich voters (i.e. voters with pre-tax income above average) and increases the post-tax income of poor voters (i.e., voters with pre-tax income below average). Therefore, a self-regarding individual will choose a tax rate of 0 or 100 depending on whether his pre-tax income is above or below average.

3.2 Other-regarding motives

So far, we have only described the choice of a self-regarding individual. Experimental evidences show, however, that in many instances, individual behaviors are not in line with payoff maximization. Individuals care about their own as well as others' payoff. In particular, inequality aversion see Fehr and Schmidt, (1999) and altruistic concerns may motivate subjects' tax rate choice. When considering rich subjects, a deviation from the tax rate of 0 (which is the payoff maximizing choice) shows the relevance of other-regarding motives, but this does not allow us to distinguish between individuals motivated by inequality aversion and individuals with other motives such as altruism. When considering poor subjects, it should be noted that a tax rate of 100 is also the tax rate which maximizes their payoff. Therefore, in view of the choice by poor subjects, for a tax rate choice of 100, it is not possible to disentangle self-regarding from inequality aversion motives. The coincidence between self-regarding and inequality aversion motives implies that poor subjects can reduce the degree of inequality across subjects' pre-tax income at no personal cost. As a consequence, when observing poor subjects voting for a tax rate below 100, we can exclude inequality aversion in favor of other forms of other-regarding motives, such as altruism and fairness, which has been shown to

[5] Also note that the pre-tax income of the voter with an exactly average pre-tax income is not affected by any tax rate.

be a relevant component in redistribution preferences e.g., Alesina and La Ferrara (2005). In summary, the following other-regarding motives can be identified in our experiment:

- "Rich" subjects voting for a redistribution tax of 100 behave in line with both inequality aversion and other forms of other-regarding preferences such as altruism and fairness;
- "Poor" subjects voting for a redistribution tax lower than 100 do not behave in line with inequality aversion but with other forms of other-regarding preferences such as altruism and fairness.

Furthermore, we expect that the mean tax rate choice will be higher for poor than for rich subjects since, in contrast to rich subjects, they should vote for a high tax rate irrespective of whether they are selfish or other-regarding.

3.3 Risk preferences

In a dictator game experiment Iriberri and Rey-Biel (2011) found that role uncertainty increased altruistic behavior. Similarly, in our experiment, we expect that, in presence of risk about the pre-tax income level, risk neutral, selfish individuals will maximize their post-tax income in expected terms. It follows that:

- If the *expected* pre-tax income of individual *i* is higher than the average pre-tax income, post-tax income will decrease with an increase in the tax rate;
- If the *expected* pre-tax income of individual *i* is lower than the average pre-tax income, post-tax income will increase with an increase in the tax rate.

This implies that in presence of risk about pre-tax income, a risk neutral selfish individual will, everything else equal, choose a tax rate of 0 or 100 depending on whether his expected pre-tax income is above or below average. A subject exhibiting risk aversion, however, may find it optimal to choose a tax rate higher than 0 and lower than 100 depending on whether his expected pre-tax income is above or below average.[6]

[6] Our approach relates to Rawls' "veil of ignorance" since individuals that are least well off benefit, if risk-aversion applies.

3.4 Entitlements

Empirical studies on redistribution preferences indicate that people are sensitive to the way income is acquired e.g., Alesina and Angeletos (2005); Alesina and La Ferrara (2005). There are several possible definitions of entitlements. The formulation of entitlement theory based on the productivity principle asserts that each household has the right to what it produces and that redistribution is unwarranted and unjust. Konow (2000) showed that the allocation behavior of disinterested observers is in line with the accountability principle. This principle proposes that subjects should only be entitled to incomes generated by the means they can reasonably influence. In line with entitlement theory, experimental results have demonstrated that more entitled subjects claim the right to keep a larger share of the generated "pie" Hoffman et *al*., (1994). The definition of entitlement, therefore, is closely related to the definition of what is the fair outcome of a situation, creating a link with individual preferences for fairness, previously mentioned when discussing about other regarding motives. Based on these statements we expect that:

- The more (less) luck is involved in generating pre-tax income, the less (more) entitled will rich (poor) subjects feel to pre-tax income and the higher (lower) will be their vote for a redistribution tax.

3.5 Self-serving bias

The subjectivness in asserting entitlements makes people vulnerable to self-serving bias Konow (2000). Based on this statement, we expect that:

- Subjects hold biased beliefs about fair allocations even after the voting procedure such that the perception of what is a "fair tax" differs between poor and rich subjects.

Table 1 summarizes the behavioral predictions discussed in this section, differentiating between rich and poor subjects.

Table 1. Behavioral Prediction about the redistribution tax

	Self- Regarding Motive	**Other-Regarding Motive**	**Entitlement**
1) Rich Subjects pre-tax income above the average	Tax rate=0	• Inequality Aversion and Altruism yields tax rate $\in(0,100)$	• Increasing entitlements, the tax rate choice decreases compared to a situation with low or no entitlements
2) Poor Subjects pre-tax income below the average	Tax rate=100	• Inequality Aversion yields tax rate=100; • Altruism and Fairness yields tax rate $\in(0,100)$	• Increasing entitlement, the tax rate choice decreases compared to a situation with low or no entitlements

4. Experimental Design

Our experiment consists of four parts. Upon entering the lab, the 31 subjects participating in each session received the instruction for the first two parts of the experiment. In part 1, the pre-tax income level is determined for each subject. In part 2, subjects vote for their preferred tax rate, and the tax rate applied to all participants in the session is chosen through a median vote system. In part 3 (which was unannounced), subjects are asked to take an impartial perspective and state a (payoff-irrelevant) *fair* tax rate. In part 4, subjects are first informed about the post-tax income and subsequently asked to answer a postexperimental questionnaire before finally receiving their payment.

In each session, the pre-tax level of the 31 subjects varies from 1,200 ECUs[7] to 0. Starting from 1,200 - which is the pre-tax income associated to the top position - the pre-tax income level is reduced by 40 ECUs for each step further down in the payment ladder. The average and median pre-tax levels are 600 ECUs, kept constant across sessions and treatments. Two income classes of the same proportion are defined as “rich” and “poor,” respectively, depending on whether subjects are assigned to a pre-tax income level above or below average. By fixing pre-tax income distribution, we keep the degree of inequality (and the composition of the income classes) constant across treatments.

[7] In the experiment, we used ECUs, converted into euros at an exchange rate of 1ECU=1 euro cent.

Finally, the taxation system implemented is neutral, meaning that there are no distortions or inefficiencies in our experiment. We acknowledge that keeping efficiency fixed prevents us from giving any consideration to how a taxation rate may impact on individual incentives to work and, in turn, on the overall efficiency level reached by society. The relevance of this issue should not be neglected, however, the main focus of this paper is to isolate the presence of other-regarding concerns, thus by avoiding any confound that different degree of inequality and efficiency across treatments may generate.

To disentangle how entitlements and risk affect people's tax rate choice, we manipulate i) the *entitlements* to pre-tax income and ii) the *timing* of the tax rate choice with respect to the information about the pre-tax income level.

4. 1 Treatments

The first manipulation entails three treatments: Equal Opportunities (EO), Unequal Opportunities (UO), and Random Assignment (RA). These treatments differ in the strength of individual entitlements to pre-tax income, which are manipulated by changing the rules of the pre-tax income assignment in part 1. In treatments EO and UO, a production phase determines subjects' pre-tax income, while no production phase is present in treatment RA. In the production phase, subjects have 20 minutes to answer 40 questions of a general knowledge quiz, a task commonly used to induce entitlements in the lab Hoffman et al. (1994); Gächter and Riedl (2005); Karagözoğlu and Riedl (2010).[8] The chosen production task requires subjects' attention; however, differently than other tasks used in real effort laboratory experiments, it also depends on subjects' ability, which we assume is at least partly acquired. As pointed out by Hoffman and Spitzer (1985), p. 2659; the definitions of the individual contribution (i.e. the "intrinsic input" on which the

[8] For each question five possible answers are provided, of which exactly one is the correct answer. The questions concern several fields of knowledge such as politics, music, religion, astronomy, and) geography. The 40 questions were randomly selected from a list of 1,893 questions, and the selected sequence was maintained constant across the sessions and treatments. Therefore, each participant receives the same set of questions in the same order. Subjects have at most 30 seconds to answer each question. They are informed that unanswered questions count as wrong answers and earn 0 points.

entitlement is based) vary and may include the time spent, the amount of work completed, and also various personal characteristics such as intelligence and social status[9]. We choose a measure of entitlement more focused on the individual performance (i.e. the amount produced) rather than on the amount of effort devoted in the task (i.e. the amount of inputs used), since we believe that this characteristic better reflects the real world situation that we want to capture.

In treatment EO, subjects earn a pre-tax income that is higher, the more questions they answer correctly. This is based on a payment ladder determining subjects' pre-tax income according to their performance in the quiz relative to other subjects in the session.[10] In treatment UO, pre-tax income is assigned both according to the relative performance in the quiz and a random component. Finally, in treatment RA pre-tax income is randomly allocated and no quiz is presented.[11] We define entitlements to pre-tax income corresponding to the performance in the production phase. Comparing treatments, we expect entitlements to pre-tax income to have the greatest strength in treatment EO where the pre-tax income level is determined exclusively by the performance in the quiz (and subjects should feel entitled to different pre-tax income levels), while we expect subjects' to feel more entitled to equal income levels in treatment RA where pre-tax income is assigned randomly.

4.1.1 High entitlements: the equal opportunity treatment (EO)

In the equal opportunity treatment (EO), the pre-tax income level of each subject is determined by his relative position in the ranking as a result of the performance in the quiz. Therefore, the subject who performed better earns the top position in pre-tax income

[9] See also Rustrom and Williams, (2000) for a discussion about effort-based and performance based entitlement.

[10] In treatments EO, UO, and UUO, participants are informed that, if two or more subjects realize the same score in the quiz, the higher pre-tax income level is assigned to the individual with the lower seating number. Seating numbers are randomly assigned to participants upon entering the lab.

[11] We acknowledge that an alternative way to implement the treatment based on pure luck would have been to maintain the production phase i.e., the quiz) and to assign pre-tax income by means of a random draw, ignoring subjects' relative performance. However, we preferred to completely eliminate the production phase in order to prevent that subjects could somehow justify their tax rate choice based on the relative performance in the quiz.

distribution (corresponding to a pre-tax income of 1,200 ECUs), while the subject who performed worse earns a pre-tax income of 0 ECUs. After subjects received feedback about their own as well as others' position and pre-tax income, phase 2 starts, in which subjects vote for their preferred tax rate. The strongest effect of entitlements is expected in this treatment.

4.1.2 Intermediate entitlements: the unequal opportunity treatment (UO)

In the unequal opportunity treatment (UO), the pre-tax income level is determined by both, performance in the quiz and luck. Prior to the quiz, subjects are randomly assigned to two income classes, *rich* and *poor*, corresponding to the top and bottom half of pre-tax income distribution, respectively.[12] Within each income class, the subject's pre-tax income level is determined by individual relative performance in the quiz. Subjects in the poor income class compete only for the positions in the bottom half of pre-tax income distribution, and their pre-tax income ranges from 0 to 600 ECUs. Subjects in the rich income class compete for the positions in the top half of pre-tax income distribution, and their pre-tax income ranges from 640 to 1,200 ECUs. In this treatment, the random assignment to the two income classes aims to reproduce, in a simplified laboratory environment, a situation in which, due to the presence of unequal opportunities, privileged (rich) subjects earn more than underprivileged (poor) subjects irrespective of their relative performance. As a consequence, the privileged and underprivileged subjects can still influence their relative position though their performance but only within their own income class. In this treatment, both entitlements and luck determine the final pre-tax income of subjects, and, compared to treatment EO, we expect a lower strength of individual entitlements to the pre-tax income.

[12] In the experiment, the two groups were marked as white (for rich) and black (for poor), and the assignment was framed as drawing a ball from a computerized urn.

4.1.3 Low entitlements: the random assignment treatment (RA)

In the random assignment treatment (RA), only luck is relevant in the determination of the pre-tax income level while individual performance has no role.[13] Subjects are assigned to a pre-tax income level by a computerized random draw. After being informed of their position, they proceed to the voting task in part 2. In this treatment, we expect subjects to feel entitled to equal income compared to treatment EO, while we expect treatment UO to be in between the two extremes, treatments EO and RA.

Our second manipulation aims to capture how risk about the future position in pre-tax income distribution affects the tax rate choice. To this extent, we take as benchmark treatment UO and manipulate the timing of the tax rate choice with respect to the information about the assignment to the rich or poor income class.

4.1.4 The unequal opportunity treatment with risk

In this treatment, subjects are required to vote for a tax rate *after* being informed about their performance in the production phase but before knowing to which income class they will be assigned. We refer to this treatment as unequal opportunities and risk (UOR) and compare it to the unequal opportunities treatment (UO). The only difference between treatments UO and UOR is that, in treatment UO, subjects know before voting whether they have been assigned to the rich or poor income class (and they also know their relative position in their class), whereas in treatment UOR, the information about assignment to the income class is only provided *after* the tax rate choice. In treatment UOR, at the moment of voting, subjects know their potential position and pre-tax income level in both income classes (i.e., they know their position in the rich income class (case in which they are rich) and in the poor income class (case in which they are poor)). They also know that they will be assigned to one of the two income classes by a computerized random draw, while the information about the income class is only provided after voting.

Table 2 summarizes our treatments, underlining the timing of the different parts.

[13] It could be argued that treatment RA also captures unequal opportunities. Compared to treatment UO, the unequal opportunities in treatment RA are less salient.

Table 2: Experimental Design and Timeline

<table>
<tr><td>Part</td><td colspan="2">Part 1
Pre-tax income determination</td><td>Part 2
vote for
tax rate</td><td>Part 3
vote as
impartial
spectator</td><td colspan="2">Part 4</td></tr>
<tr><td>Treatment</td><td colspan="2">Feedback
before Part 2</td><td colspan="3">Final
Feedback</td></tr>
<tr><td>EO</td><td>Performance</td><td rowspan="2">• Individual ranking
• Position in pre-tax income distribution</td><td rowspan="3">Vote for the preferred tax rate [0-100]</td><td rowspan="3">Vote as impartial spectator (hypothetical question)</td><td rowspan="2">• Selected tax rate</td><td rowspan="3">Postexperimental questionnaire and payments</td></tr>
<tr><td>UO</td><td>Performance + Luck</td></tr>
<tr><td>RA</td><td>Luck</td><td rowspan="2">• Individual ranking</td><td rowspan="2">• Position in pre-tax income distribution
• Selected tax rate</td></tr>
<tr><td>UOR</td><td>Performance + Luck</td></tr>
</table>

In the first manipulation, going from treatment EO to treatment RA implies a decreasing impact of entitlements on the pre-tax income. To this, it corresponds an increasing role played by luck in determining pre-tax income as compared to the role played by ability. Specifically, by comparing the tax rate choices in treatments EO and UE, we aim to test to which extent unequal opportunities increase other-regarding behavior (measured as individual willingness to pay tax). Indeed, based on these treatments we could make the straightforward and testable prediction that self-interested, rich subjects will vote for a minimum tax rate of 0.

In the second manipulation, comparing the tax rate choice across the treatments UO and UOR, we aim to disentangle the effect of risk about future pre-tax income from other-regarding preferences.

5. Experimental Procedures

The experiment was programmed in z-Tree Fischbacher, (2007) and conducted in the experimental laboratory of the Max Planck Institute of Economics Jena, (Germany) in April 2012. The subjects were undergraduate students from the Friedrich Schiller

University Jena; they were recruited using the ORSEE software Greiner (2004). Upon entering the laboratory, they were randomly assigned to visually isolated computer terminals. The four treatments were run one-shot in a between-subject design, i.e., each subject participated in only one of four treatments. We ran three sessions per treatment. Each session involved 31 participants, as shown in Table 3. Sessions lasted about 90 minutes.

Table 3. Participants

	EO	**UO**	**RA**	**UOR**	**Total**
Session	3	3	3	3	12
Participants	93	93	93	93	372
% Male	45.16%	37.63%	43.01%	39.56%	41.35%

Average earnings of the experiment were 13 € including 3 € for showing up (plus 4 € for answering the postexperimental questionnaire), ranging from 6.4 € to 15.40 €. Table 4 contains summary statistics about the average number of correct answers from the production phase in each treatment, the gender composition of our subjects, and variables from the postexperimental questionnaire.[14]

Table 4. Summary Statistics

Variables	**Mean**	**Std.Dev**	**Min-Max**
Production Task EO	16.58	3.37	11 – 26
Production Task UO	16.17	3.53	9 – 27
Production Task UOR	16.97	3.69	7 – 25
Male (=1 if male)	0.41	-	0 – 1
Political Preferences (=1 if left, 10 if right)	4.55	1.51	1 – 9
Mothers Education (=1 if university education)	0.42	-	0 – 1
Religious (=1 if member of an organized religion)	0.16	-	0 – 1
East (=1 if raised up in the formal East Germany)	0.44	-	0 – 1

[14] According to a set of Mann-Whitney tests, the average performance did not differ across treatments (EO vs. UO, z=0.703, p-value=.4820; EO vs. UOR: z= -0.830, p-value=.4065; UO vs. UOR: z=-1.462, p-value=.1428). Based on this evidence, we can affirm that the manipulation of entitlements in part 1 has no effect on the average performance.

6. Results

We present our experimental results in four subsections. Subsection 6.1 investigates if subjects' tax rate choices are in line with self-interest or if they exhibit other-regarding preferences. In Subsection 6.2, we analyze how a change in the strength of the entitlements to the pre-tax income affects subjects' tax rate choice. Subsection 6.3 focuses on how uncertainty about the pre-tax income level affects subjects' tax rate choice. Finally, in Subsection 6.4 we test if people conflate what is fair with what benefits themselves (i.e., the presence of self-serving bias).

6. 1 Tax rate choice and other-regarding preferences

To test whether subjects' behavior is in line with self-interest, we distinguish rich and poor subjects (i.e., with a pre-tax income above and below average). Choosing a tax rate higher than zero, a rich subject shows other-regarding behavior. Result 1 summarizes our findings.

Result 1. *Voting behavior cannot be entirely explained by self-interest.*

Support of Result 1 is found in Table 5, panel a), which shows the proportion of subjects whose behavior is not in line with self-interest. A majority of rich subjects vote for a positive tax rate, and their share ranges from 55 in treatment EO to 80 in treatment UOR. We consider this evidence in treatments EO, UO, and RA coherent with the fact that subjects exhibit other-regarding preferences.[15] However, even if we find support for the relevance of other-regarding motives in subjects' tax rate choices, the self-interest component remains present as an explanation. A set of two sample tests of proportion shows that, in all treatments, a significantly higher proportion of poor subjects choose a positive tax rate, as compared to the proportion of rich subjects (EO: z=5.0559, p-value=0.0000; UO: z=4.5322, p-value=0.0000; RA: z=2.5712, p-value=0.0051; UOR: z=3.0336, p-value=0.0001). Also note that among poor subjects, no one voted for a tax

[15] In treatment UOR, this interpretation is not straightforward since under this treatment subjects are defined as rich or poor based on whether their *expected* pre-tax income is above below) average.

rate of 100%, which means that inequality aversion as well as self-regarding behavior is rejected.[16]

Table 5. Percentage of subjects choosing a non-zero and unit tax rate panel a), and mean tax rate choice panel b)

	EO	**UO**	**RA**	**UOR**
Group	*High Entitlement*	*Moderate Entitlement*	*Low Entitlement*	-
a) Percentage of subjects choosing a tax rate > 0 is (< 100)				
1) Rich Subjects (pre-tax income above the average)	53.33% (98.78%)	60.00% (98.78%)	73.33% (100%)	81.25% (100%)
2) Poor Subjects (pre-tax income below the average)	97.92% (100%)	97.92% (100%)	100% (100%)	97.78% (100%)
3) Average	73.66% (98.92%)	79.57% (98.92)%	87.10% (100%)	89.25% (100%)
b) Mean Tax Rate Choice Std.Dev. in Parenthesis)				
1) Rich Subjects (pre-tax income above the average)	15.38 (20.78)	17.62 (24.14)	22.58 (26.08)	31.27 (27.14)
2) Poor Subjects (pre-tax income below the average)	84.58 (22.45)	86.44 (23.55)	86.25 (18.34)	62.6 (30.73)
3) Average	51.10 (40.90)	53.14 (41.93)	55.44 (38.99)	46.43 (32.8)

Note: In all treatments, N=93. In treatment 3, the subjects are uncertain about their final position in the pre-tax income distribution; therefore we consider the *expected* pre-tax income rather than the pre-tax income.

Panel b) in Table 5 considers the average tax rate choice instead of the proportion. According to a set of Wilcoxon signed-rank tests, in each treatment the tax rate chosen by

[16] Using distribution experiments, Engelmann and Strobel (2004) and Charness and Rabin (2002) found (using distribution experiments) that a combination of efficiency concerns, maxmin preferences, and selfishness explained the data well, while two theories based on inequality aversion i.e., Fehr and Schmidt, (1999), and Bolton-Ockenfels (2000) were unable to explain important patterns. Note that in our experiment, we eliminate, by design, the trade-off between efficiency and other forms of other-regarding concerns.

rich subjects is significantly different from 0 for any conventional significance level. Consistently with the result in panel a), we also find that rich subjects vote for a significantly lower tax rate than poor subjects.

In each treatment, this difference in the average tax rate chosen by the subjects in the two different groups is significant according to a set of Mann-Whitney tests[17] (EO: z= 7.836, p-value =0.0000; UO: z= 7.624, p-value =0.0000; RA: z= 4.600, p-value= 0.0000; UOR: z= 7.629, p-value =0.000). Hence, we can conclude that subjects do exhibit other-regarding concerns.

6.2 Tax rate choice and entitlements

In this subsection, we investigate how entitlements to the pre-tax income affect individual tax rate choice. We therefore compare treatments EO, UO, and RA. We expect subjects in treatment EO to have the strongest level of entitlements, while different subjects in treatment RA should have the same entitlements. Treatment UO represents an intermediate situation since both individual performance and luck play a role in the determination of the pre-tax income level. Result 2 summarizes our findings.

Result 2. *Entitlements affect subjects' tax rate choice. When luck determines the pre-tax income level, subjects with a pre-tax income above average are more likely to vote for a positive tax rate. The effect on the average tax rate is, however, only statistically significant in comparing treatment RA with EO, and the effect is relatively small.*

Support for Result 2 can be found in Table 5. Panel a) shows that the share of rich subjects voting for a positive tax rate increases as entitlements decreases across treatments. The treatment effects are shown to be significant using a set of two sample tests of proportion (EO vs. UO: z=-2.8781, p-value=.0020; EO vs. RA: z= -1.9687, p-

[17] For the sake of brevity, we report in the main text only results from non-parametric tests. If not specified differently in the main text, t-test returns the same results.

value=0.0245; UO vs. RA: z= -1.3416, p-value=0.0899). We observe a different effect of entitlements on poor and rich subjects: poor subjects do not show sensitivity to the treatment manipulation, i.e., the share of poor subjects voting for a positive tax rate is about the same in all treatments.

Panel b) of Table 5 shows the average tax rate choice across treatments by income classes. The difference across treatments in the average tax rate choices for rich subjects is only statistically significant when comparing the treatments with high and no entitlements. Comparing treatment EO with treatment RA, we observe an increase in the tax rate choice from about 15 to 23% (EO vs. RA; z=-1.664, p-value=0.0960; EO vs. UO: z=-.493, p-value=.6223; UO vs. RA z=-1.238, p-value=0.2157). Also note that the asymmetric effect is present even when considering the average tax rate: poor subjects voted for a relatively high tax rate in all treatments, and there are no considerable differences between the treatments despite the manipulation of entitlements.

So far, the first two sets of results show that a substantial share of the subjects' tax rate choice is not consistent with pure payoff maximization. Comparing the results of treatments EO and RA, these also show, on average, a significantly higher willingness to pay tax. The results suggest that when the circumstances are extremely unfair and resources are randomly allocated, privileged rich subjects (i.e., with a pre-tax income above average) will be more likely to vote for a positive tax rate.

6.3 Tax rate choice and risk

In this subsection, we analyze if the risk about benefiting or forfeiting from unequal opportunities affects the subject's tax rate choice. We therefore compare the tax rate choices in unequal opportunities treatments with and without risk (i.e., UO and UOR). In all comparisons, subjects voting in treatment UO know with certainty both their performance, their pre-tax income class, and their pre-tax income level, while subjects voting in treatment UOR are only informed about their own performance and do not know whether they are going to be randomly assigned to the rich or the poor income class. Result 3 summarizes our findings.

Result 3. *Risk about who will benefit from unequal opportunities makes subjects behave as if they were less self-regarding*.

Support for Result 3 can be found comparing columns 3 and 5 in panel a) of Table 5. Risk substantially increases the share of rich subjects who vote for a positive tax rate from 60% in UO to more than 80% in UOR. This difference is statistically significant using two sample test of proportions (UO vs. UOR: z=-2.2562, p-value=0.0120). For the same subjects we note the average tax rate chosen comparing columns 3 and 5, in panel b) of Table 4. This increases from about 18% in treatment UO to more than 30% in UOR, and this difference is significant according to a Mann-Whitney test (UO vs. UOR: z=-2.702, p-value=0.0069). Rich subjects are more willing to vote in favor of a higher redistribution compared to when they do not know for a certainty the income class assigned to them.

Consider now the poor subjects: the comparison of columns 3 and 5 in panel a) of Table 5 shows that risk does not considerably affect the share of subjects voting for a positive tax rate. While one could expect a decrease in the share of subjects voting a tax rate of zero since the subjects with high expected pre-tax income in UOR do not know for a certainty whether they will be assigned to the rich or the poor income class, we should also note that the share of subjects that chose a zero tax rate is already considerably low in UO. If, for the same subjects we note the average tax rate, we observe a considerable decrease from 86% in treatment UR to 63% in treatment UOR, and this difference is significant using the Mann-Whitney test (UR vs. UOR, 3.897, p-value=0.0001).

In summary, when subjects face a risk about their particular income class, their tax rate choice changes: subjects with expected earnings above average are more willing to vote in favor of redistribution. An increased risk of being assigned to the group with low pre-tax income increases the chosen tax rate, while an increased risk of being

assigned to the group with high pre-tax income decreases the tax rate.[18] Our results show that risk changes the vote of holders with high and low expected pre-tax incomes such that they behave *as if* they were less self-regarding.

Comparing the treatment effect of risk (UOR vs. UR) with the treatment effect of entitlements (UO vs. EO), the effect of the latter seems much weaker. This is notable since it suggests that the self-regarding component in the tax rate choice is rather dominating.

6.4 Partial and impartial perspective

In this subsection, we test if people exhibit a self-serving bias when deciding as impartial spectators (i.e., if they conflate what is fair with what benefits themselves). In all treatments, after voting in part 2 and before receiving feedback about the selected tax rate (and post-tax income), subjects are asked to vote a second time for a *fair* tax rate, taking the perspective of an impartial spectator with no stakes in the decision.[19] In what follows we will refer to the tax rate choice made in part 3 as the fair and impartial tax rate choice. We test whether subjects in the role of impartial spectator disregard their previous position in the pre-tax income distribution in part 2. If we observe that the fair and impartial tax rate choice differs depending on the subjects' pre-tax income in part 2, this supports the existence of a self-serving bias see, e.g., Festinger (1957); Babcock and Loewenstein, (1997); Konow, (2000).

[18] Note that our results are in line with Rawls' prediction that risk aversion would make people vote for a more equal society. Note, however, that in contrast to Rawls' veil of ignorance, where the decision maker does not have any knowledge about own ability, subjects in our experiment are informed about their relative performance and could and actually did) condition their decision on expected earnings.

[19] The screen shot in this part states the following: "In the experiment you voted for a tax-level corresponding to [the chosen tax level is displayed]. You will not take any more decisions that can alter your final payoff. However, before you get feedback about your final earnings we would like you to answer the following hypothetical question. From a non-involved impartial person's point of view that's post-tax payoff is not affected by the tax-level, "what would be a 'fair' tax rate in the experiment according to your opinion? Please answer to the question by choosing a tax rate between 0-100. You can choose a tax rate by moving the arrow from the extreme left (where tax rate is equal to 0%) to the right (where the tax rate is equal to 100%)."

Result 4. *When deciding as impartial spectators, subjects' choice is affected by their role in the experiment. The difference evidences self-deception but is only prominent if pre-tax income is not distributed randomly and entitlements are high.*

Support for Result 4 is contained in Table 6 which shows the fair impartial tax choices across the different treatments. When asked to vote for a fair tax rate as impartial spectators, subjects on average vote for a tax rate around 50%, although in some cases we observe a difference between the choice of subjects who in part 2 were rich or poor. When comparing the two tax rates chosen in parts 2 and 3 (i.e., the partial with the fair and impartial tax rate) by means of a set of Wilcoxon signed-rank tests, we find that both subjects with (expected) pre-tax income above and below average revise their tax rate choice made in part 2. Specifically, in all treatments, rich subjects, when asked to vote from an impartial perspective, choose a significantly higher tax rate than they voted for in part 2 (EO: z=-4.752, p-value=0.0000; UO: z=-5.118, p-value=0.0000; RA: z=-4.435, p-value=0 .0000; UOR: z=-5.093, p-value=0.0000).

Table 6. Impartial Spectator perspective: Tax Rate Choice and pre-tax income level, (St. Errors in Parenthesis)

	EO	***UO***	***RA***	**UOR**
Group	*High Entitlement*	*Moderate Entitlement*	*Low Entitlement*	-
Rich (pre-tax income above the average)	43.11 (4.68)	48.16 (4.54)	57.11 (4.69)	49.19 (3.74)
Poor (pre-tax income below the average)	53.08 (4.01)	53.08 (3.92)	55.56 (4.83)	46.8 (3.74)
Average	48.26 (3.09)	50.70 (2.98)	56.31 (3.35)	48.03 (2.63)

In all treatments, poor subjects, when voting in part 3, choose a significantly lower tax rate than in part 2 (EO: z=4.611, p-value=0.0000; UO: z=4.921, p-value=0.0000; RA, z=2.245, p-value=0.0248; UOR, z=4.340, p-value=0.0000.). We interpret this evidence as

showing that subjects in both income classes at least partly acknowledge that by their choice in part 2 they benefit themselves. But the fact that a subject revises his choice as impartial spectator does not speak against the existence of self-serving bias.

The gap between the fair tax rates chosen by subjects in the role of impartial spectator is considerable if we compare rich and poor subjects, and it is particularly prominent in treatment EO, where entitlements to the pre-tax income are highest. In each treatment, we compare, by means of a Mann-Whitney test, the tax rate choice depending on the subjects' pre-tax income level. A significant difference between the votes of subjects in the two income groups is found but only in treatment EO (EO: z=1.742; p-value=0.0815; UO: z=0.885; p-value=0.3759; RA: z=-0.428; p-value=0.6690 and UOR: z=0.269; p-value=0.7881). Our results suggest that self-serving bias is stronger when the pre-tax income is assigned on the basis of individual performance and the random component plays no role. It seems plausible that the cognitive cost of self-deception is greater in the treatments where a random component plays a significant role.

6.5 Comparing the treatment effects

Before we present the econometric analysis, we briefly compare the treatment effects on tax rate choices relative to entitlements, self-serving bias, and risk. The first effect, related to entitlements, is weakest: even when comparing the treatment with strong entitlements (i.e., EO, where pre-tax income was assigned on the basis of performance) to the treatment with no entitlements (i.e., RA, where pre-tax income was assigned randomly), we find a significant difference only in the tax for subjects with a pre-tax income above average. In this case, the tax rate chosen increased from about 15 to 23%. The second effect, related to self-serving bias, seems to be marginally stronger than entitlements. In treatment EO, when asked to vote for a fair and impartial tax, rich subjects chose a tax rate of 43% while poor subjects chose a tax rate of 53%. The third effect, related to risk, is the strongest in all treatments. Our results show that risk about income class (i.e., about who will benefit from unequal opportunities) makes subjects behave *as if* they were less self-regarding. When comparing treatments UO and UOR, the average tax rate choice of rich subjects with an (expected) pre-tax income above average

increases from about 18 to 31%. For subjects with an (expected) pre-tax income below average the tax rate choice decreases considerably from 86 to 63%.

Our results show that entitlements have a weak effect and that a large amount of heterogeneity within the two income classes cannot be explained by the self-regarding component. One possible explanation is that voting behavior is explained by individual differences such as family background and political preferences, which have been shown to matter e.g., Alesina and La Ferrara (2005); Alesina and Giuliano (2009).

6.6 Econometric analysis

To investigate individual differences and the role of these factors in the tax rate choice, we estimated a fractional logit model Papke and Wooldridge, (1996). Results are presented in Table 7. The tax rate chosen by each subject is used as dependent variable, and the subject's expected earnings, dummies for treatments EO, UO, and RA as well as the interaction of these dummies with the dummy high pre-tax (which takes value 1 if the subject has an income above average and 0 otherwise) are included as independent variables. We also include gender, political preference measured on a scale (1-10), information about the education of the subject's mother and the subject's religion. Finally, we also include information on whether the subject grew up in former East Germany.

We find that male, left-wing political preferences and subjects coming from a household with university-educated parents[20] have a higher willingness to pay tax. Religion and demographics were highly insignificant. The sign of the political preferences and parents' education variable is in line with expectations, while previous evidence of the gender effect is mixed and therefore included without clear expectations. Finally, we find no difference in the willingness to pay taxes by students from East and West Germany. [21]

[20] We tested for fathers' as well as mothers' education and found about the same effect on the willingness to pay tax.

[21] This is in contrast with the finding reported in Brosig-Koch et *al.* (2011) who, using a solidarity game found that East Germans consistently showed less solidarity than West Germans even after 14 years and conclude that the solidarity gap between East and West Germany did not close in twenty years and that the convergence is slower than has been convincingly argued.

Table 7. Fractional Logit Estimation

	Dependent variable = tax rate		
Independent Variables	**dy/dx**	**Std.Err**	**P-value**
Expected Earnings	-0.0006793	0.00012	0.000
Treatment EO	0.2537166	0.2537166	0.000
Treatment UO	0.3029845	0.3029845	0.000
Treatment RA	0.2873163	0.2873163	0.000
Treatment EO * High pre-tax	-0.4222691	0.06227	0.000
Treatment UO * High pre-tax	-0.4342317	0.06528	0.000
Treatment RA * High pre-tax	-0.3623928	0.06816	0.000
Male (=1 if male)	0.1080888	0.04254	0.011
Political Preferences	-0.023846	0.01421	0.093
Mothers Education	0.0886782	0.04211	0.035
Religious	-0.051996	0.05369	0.333
East	-0.023846	0.04122	0.674
Log pseudo likelihood		-143	
Nr. Obs.		372	

7. Conclusion

We studied individual preferences for income redistribution in multi-person settings using a framed tax experiment. While in the literature taxes are traditionally discussed according to the ability to pay principle (i.e., the amount of taxes someone pays should increase as their income increases) and the productivity principle (i.e., those individuals that benefit more should pay more), we test a definition of entitlements based on the accountability principle. This principle requires that a person's fair allocation of income vary in proportion to the relevant variables that he can influence, but not in proportion to those variables that he cannot reasonably influence. The relevance of entitlements has been extensively documented in the bargaining literature, typically on bilateral relationships where transfers are made voluntarily by one individual to benefit another. We focused on multi-person settings where each subject faces a "society" composed of 30 other participants. A redistribution of tax affects all members of this society, and the choice of the decision maker is therefore different than in a bilateral setting.

Four key findings have emerged. First, while there exists a considerable heterogeneity with a substantial share of both payoff maximizers and subjects exhibiting

behavior consistent with other-regarding preferences, our data is not consistent with inequality aversion but points to other forms of other-regarding preferences. Second, although entitlements based on the accountability principle have some impact on the willingness to redistribute pre-tax income, the effect is relatively weak. A difference in the willingness to redistribute income is found compared to the baseline treatment, when pre-tax income is generated by ability in a production task to when it is generated by luck, but not compared to the intermediate case when pre-tax income is determined by a combination of both luck and ability. Third, the uncertainty of subjects not knowing whether they will or will not benefit from randomly allocated opportunities affects the chosen tax rate such that the former behave as if they were more other-regarding. Fourth, when, after the tax rate choice, stakeholders are asked (without any payoff consequences) to state the tax rate they consider to be fair, they have different perceptions depending on the pre-tax income level they were assigned in the experiment. In line with self-serving bias, subjects with a pre-tax income above average state a fair tax rate that is lower than the tax rate stated by subjects with a pre-tax income below average. We only found this effect in the treatment where pre-tax income is assigned based purely on ability. Further research is needed to identify and disentangle other-regarding motives different than inequality aversion able to explain individuals' redistribution choices in a multi-person setting.

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Appendix. Experimental Instruction

In what follow we report the experimental instruction for our treatments. Differences across treatments are reported using different fonts and indicated with the following abbreviation: EO=Equal Opportunity Treatment; UO=Unequal Opportunity Treatment; RA=random assignment treatment; UOR=Unequal Opportunity Treatment with Risk.

Instructions

Welcome! You are about to participate in an experiment funded by the Max Planck Institute of Economics. Please switch off your mobile and remain quiet. It is strictly forbidden to talk to the other participants. Whenever you have a question, please raise your hand and one of the experimenters will come to your aid.
You will receive 3 Euros for showing up on time and participating. Besides this, you can earn more. The show-up fee and any additional amounts of money you may earn will be paid to you in cash at the end of the experiment. Payments are carried out privately, i.e., the others will not see your earnings.
During the experiment we shall speak of ECUs Experimental Currency Unit) rather than Euros. The conversion rate between them is 100 ECUs = 1 euro.
This means that for each ECU you earn you will receive 1 Euro cent.
To simplify, in the following we are only speaking of male participants.
All instructions are identical for all participants and we read them aloud such that you can verify this.

Detailed Instruction

The experiment has 2 stages. In stage 1 you will earn your pre-tax income and in stage 2 you will vote for the level of redistribution tax that can reduce the payoff differences between all participants. We will first describe details of the two stages and then we will inform on how the final earnings are determined.

Stage 1. Earning pre-tax income.

In the stage 1 of the experiment you will be asked to answer 40 trivia questions. For each question, there are 4 given answers, but only 1 of them is correct. In this stage you will earn your **pre-tax income**. The pre-tax income is dependent on the number of correct answers that you and other participants give to the trivia questions.

You will have 30 seconds to answer each question. In each screen you will see one question. After answering the question on a given screen, please click the OK-button to go to the next screen. After 30 seconds the screen will automatically disappear and it will not possible to answer that question anymore. You will see the time left for answering each question in the top right of the screen. After the first 20 questions you will get a break of 2 minutes. Now we will explain in detail how to calculate your pre-tax income.

How pre-tax income is calculated.
[Unequal opportunity treatment in brackets. **Bold = UO and UOR treatment**, *Italics*= UOR; Underlined=RA]

[All subjects will be randomly assigned to one of two groups, group A and group B. Group A has sixteen members and group B has fifteen members. Your pre-tax income will depend on:

- **your relative performance in your group**
- **whether you are randomly assigned to be a black or white participant]**

For each correct answer you will receive 1 point while no or incorrect answer gives no points. Once the time for answering the trivia questions is finished, we will count the number of points realized by each participant **[in each group]** and, we will rank the participants in the sessions from the highest to lowest.
[At this point another random draw takes place in order to assign a color black (or white) to all members in group A and B respectively. The white participants will be assigned to positions 1-15, which give the highest pre-tax income while the black participants will be assigned to positions 17-31, which give the lowest pre-tax income. Depending on whether group A or group B is assigned to the color black, position 16 will be taken by a white or a black participant.

For example, suppose you are in group B and you and other participants in your group is assigned the color white while group A is assigned color black. Then the fifteen white participants of your group will be assigned to position 1 to 15, depending on the points that they obtain. The **[white]** participant with the highest number of points will be assigned to the 1st position in the ranking. To the first position corresponds the highest pre-tax income level, i.e. 1200 ECUs. Then the **[white]** participant ranked as second will be assigned to the 2nd position in the ranking, to which corresponds a pre-tax income of 1160 ECUs and so on, with the **[white]** participant who obtained the lowest amount of point obtaining the 31 st **[15 st]** position and a pre-tax income equal to **[64]**0. If several participants **[of same color]** obtain the same number of points, the participant assigned to the lowest PC number will get higher pre-tax income level.

[The 16 black participants will be assigned to position 16 to 31. The black participant with the highest number of points will be assigned to the 16st position in the ranking to which corresponds a pre-tax-income level of 600 ECUs. Then the black participant ranked as second will be assigned to the 17th position in the ranking, to which corresponds a pre-tax income of 560 ECUs and so on, with the black participant who obtained the lowest amount of point obtaining the 31st position and a pre-tax income equal to 0. Notably, irrespectively of their relative performance among all participants the white participants will always be paid more than black participants.]

In this way the 31 participants in this session are assigned to one of the 31 pre-tax income levels, as shown in Table 1. Note that the pre-tax income levels ranges from 0 to 1200 ECUs. Starting from the highest level, the other levels are obtained by subtracting 40 ECUs for each position in the ranking (see table 1).
Before voting for a tax level, in stage 2, you will [*not*] be informed about **[which color was assigned to you and your group and about]** your pre-tax income. [*You will be informed about you relative performance in your group but you will not know whether you are in the high pre-tax income or low pre-tax income group since you do not know your color.*
You will be informed of the two possible pre-tax income levels that you will obtain in the case in which you will be assigned to the color white and to the color black, respectively. For example, assume that you are assigned to group B and that you are the participant with the highest number

of points in your group. Then you will be informed that if color white is assigned to your group, then you will have the first position in the ranking and a pre-tax income level equal to 1200 ECUs. On the contrary, if the color black is assigned to your group, then, you will be assigned to position 17th in the ranking and you will have a pre-tax income equal to 560 ECUs.].

[In the stage 1 of the experiment you will earn your **pre-tax income**. The pre-tax income is dependent on a computerized random draw which assigns the 31 participants in this session to one of the 31 pre-tax income levels, as shown in Table 1. Note that the pre-tax income levels ranges from 0 to 1200 ECUs. Starting from the highest level, the other levels are obtained by subtracting 40 ECUs for each position in the ranking (see table 1)].

Table 1. Positions in the Ranking and Pre-tax Income levels

Position in the ranking	Level of Pre-Tax Income (in ECUs)	**[Color**
1st	1,200	**White**
2nd	1,160	**White**
3rd	1,120	**White**
4th	1,080	**White**
5th	1,040	**White**
6th	1,000	**White**
7th	960	**White**
8th	920	**White**
9th	880	**White**
10th	840	**White**
11th	800	**White**
12th	760	**White**
13th	720	**White**
14th	680	**White**
15th	640	**White**
16th	600	**Black**
17th	560	**Black**
18th	520	**Black**
19th	480	**Black**
20th	440	**Black**
21st	400	**Black**
22nd	360	**Black**
23rd	320	**Black**
24th	280	**Black**
25th	240	**Black**
26th	200	**Black**
27th	160	**Black**
28th	120	**Black**
29th	80	**Black**
30th	40	**Black**
31st	0	**black]**

Are there any questions on how the different pre-tax income levels are determined and on how each participant is assigned to one of them? Now will proceed with the instruction of stage 2.

Stage 2. Voting on a Tax Rate.

In this stage we will provide an opportunity for you and the other participants to vote on an income redistribution plan for the group. This part of the instruction explains the redistribution process, how you can vote, and how all votes are tabulated to produce the group tax rate.

How post tax-income is calculated.
Under the redistribution plan, some percentage of every participant's pre-tax income will be collected as tax and put into a group account. Then, every participant will receive an equal share of the group account. Post-tax income is therefore obtained as one's pre-tax earnings, minus tax payment, plus one's equal share of the group account, as summarized below:

Your Post-tax Income= Your Pre-Tax Income – Tax Payment + Equal share of the Group Account

Let's do an example of the redistribution process by using the Table 1. Imagine that a tax rate of 50% is selected. In order to calculate the amount of tax that each participant has to pay, we have to multiply the pre-tax income by the tax rate i.e. 0.50, (see column 3 in table 2). By summing up all the tax paid by each participant we obtain the total amount in the group account, which in this case is equal to= 9,300. Then, every participant will receive an equal share of the group account, therefore 9,300/31=300. In Table 2, this calculation is done in column 4. Finally in column 5 the post-tax income is calculated. For each participant it is obtained as the pre-tax income- the tax amount + the equal share from the group account.
Note that for the participant who is ranked 16th in gray (in Table 1) there is no difference between the pre-tax and the post-tax income. This is true for any tax rate level for the participants who is ranked 16th. Moreover, notice that participants in the position 17-31 of the ranking benefits from the introduction of any positive tax: their post-tax income is greater than their pre-tax income.
The opposite is true for the participants who are in the positions 1-15 of the ranking. Their pre-tax income is lower than the post-tax income. Once the tax is introduced their pre-tax income is re-distributed in favor of the participants who are in the bottom half of the ranking.

In table 2 we have chosen as example a tax rate of 50%. Now we will consider two extreme cases: tax rate equal to 0 and tax rate equal to 100%.

Example 1. Tax rate is equal to 0.
Having a tax rate equal to 0 means that there is no difference between the pre-tax and post-tax income for all participants. Therefore, in order to determine the post-tax income it is sufficient to look at the column 2 of Table 2.

Example 2. Tax rate is equal to 100.
Having a tax rate equal to 100% implies that every participant in each position pays a tax which is equal to the total amount of his/her pre-tax income. This means that each participant earn the same post-tax income equal to 600 ECUs irrespectively from the position s/he gained in the rank.

In the experiment you will be asked to vote on your preferable tax rate which could be anything between 0 and 100%. Higher taxes implies more equal post-tax incomes, lower taxes implies

greater difference in post-tax incomes where those that perform better receive higher post-tax incomes.
Are there any questions on how the post-tax income levels are determined?
Now will explain **how the Tax rate which applies to all the participants is obtained.**

Table 2. Pre-tax income and post-tax income when the tax rate is equal to 50%.

Column 1	**Column 2**	**Column 3**	**Column 4**	**Column 5**
Position in the ranking	**Level of Pre-Tax Income (in ECUs)**	**Amount of Tax If tax rate 50%)= Pre-Tax Income * 0.50 (in ECUs)**	**Equal share from the group account.**	**Post Tax Income= Pre-tax Income- Tax+ Equal Share**
1st	**1,200**	1,200*0.50= **600**	9,300/31= **300**	1,200-600+300= **900**
2nd	**1,160**	1,160*0.50= **580**	9,300/31= **300**	1,160-580+300= **880**
3rd	**1,120**	1,120*0.50= **560**	9,300/31= **300**	1,120-560+300= **860**
4th	**1,080**	1,080*0.50= **540**	9,300/31= **300**	1,080-540+300= **840**
5th	**1,040**	1,040*0.50= **520**	9,300/31= **300**	1,040-520+300= **820**
6th	**1,000**	1,000*0.50= **500**	9,300/31= **300**	1,000-500+300= **800**
7th	**960**	960*0.50= **480**	9,300/31= **300**	960-480+300= **780**
8th	**920**	920*0.50= **460**	9,300/31= **300**	920-460+300= **760**
9th	**880**	880*0.50= **440**	9,300/31= **300**	880-440+300= **740**
10th	**840**	840*0.50= **420**	9,300/31= **300**	840-420+300= **720**
11th	**800**	800*0.50= **400**	9,300/31= **300**	800-400+300= **700**
12th	**760**	760*0.50= **480**	9,300/31= **300**	760-380+300= **680**
13th	**720**	720*0.50= **360**	9,300/31= **300**	720-360+300= **660**
14th	**680**	680*0.50= **340**	9,300/31= **300**	680-340+300= **640**
15th	**640**	640*0.50= **320**	9,300/31= **300**	640-320+300= **620**
16th	**600**	600*0.50= **300**	9,300/31= **300**	600-300+300= **600**
17th	**560**	560*0.50= **280**	9,300/31= **300**	560-280+300= **580**
18th	**520**	520*0.50= **260**	9,300/31= **300**	520-260+300= **560**
19th	**480**	480*0.50= **240**	9,300/31= **300**	480-240+300= **540**
20th	**440**	440*0.50= **220**	9,300/31= **300**	440-220+300= **520**
21st	**400**	400*0.50= **200**	9,300/31= **300**	400-200+300= **500**
22nd	**360**	360*0.50= **180**	9,300/31= **300**	360-180+300= **480**
23rd	**320**	320*0.50= **160**	9,300/31= **300**	320-160+300= **460**
24th	**280**	280*0.50= **140**	9,300/31= **300**	280-140+300= **440**
25th	**240**	240*0.50= **120**	9,300/31= **300**	240-120+300= **420**
26th	**200**	200*0.50= **100**	9,300/31= **300**	200-100+300= **400**
27th	**160**	160*0.50= **80**	9,300/31= **300**	160-80+300= **380**
28th	**120**	120*0.50= **60**	9,300/31= **300**	120-60+300= **360**
29th	**80**	80*0.50= **40**	9,300/31= **300**	80-40+300= **340**
30th	**40**	40*0.50= **20**	9,300/31= **300**	40-20+300= **320**
31st	**0**	0*0.50= **0**	9,300/31= **300**	0-0+300= **300**
		Sum of the tax paid=**9,300**		

How to vote.
The tax rate placed on the group will be chosen by **voting**. Every person will vote on the tax rate s/he wants to apply to the group by choosing a tax rate between 0% and 100%. The median vote that is, the voter in the exact middle of a ranking of voters will be chosen as the effective tax rate

used to determine the post-tax income. **This simply means that you should vote whatever tax rate you believe should be applied to the whole group.**

Let's do some examples of the voting process to give to you the intuition. For simplicity, suppose that 7 participants cast the votes. We call them Voter A, B, C, D, E, F, G.

EXAMPLE 1. Imagine that these are the tax rates chosen by each voter:

- Voter A=31%
- Voter B=64%
- Voter C=53%
- Voter D=27%
- Voter E=15%
- Voter F=75%
- Voter G=5%

In order to define which is the median vote we order the tax rates chosen, from the lowest to the highest, as shown in Table 3. The median vote is the one expressed by Voter A (the 31%). Once we have ordered the tax rate chosen, Voter A is the 4th and s/he has 3 other tax rates chosen which are above and below.

EXAMPLE 2. Now imagine that voters in the positions 5, 6 and 7 desire to increase even more their tax rates. It can be easily seen that as long as the median voter does not change his/her vote, the tax rate remains at 31%. The same happens if the voters in the position 1,2 and 3 desire to lower even more their tax rate. The median voter will be Voter A and the selected tax rate does not change.

EXAMPLE 1		
Position	Voter	Preferred tax rate
1	Voter G	5%
2	Voter E	15%
3	Voter D	27%
4	Voter A	31%
5	Voter C	53%
6	Voter B	64%
7	Voter F	75%

Then we will inform you about the selected tax rate and the resulting post-tax income and we will call you for the payment at the desk.
Are there questions about the voting process or anything we have reviewed so far?

Summary
Here a summary of the experimental stage and the timing of your decisions as well as of the information that we provide to you.

- Stage 1: answer 40 trivia questions to earn your pre-tax income.
  - You have 30 second to answer each question
  - You earn 10 points for each correct answer, 0 points for each not-correct/answered

  - DETERMINATION of PRE-TAX INCOME
    - **You are randomly assigned to two groups: A and B**
    - **Each group and all the members of the group are assigned to a color: white or black.**
    - Depending on how many points you and other participants **[in your group]** obtained, you will be assigned to a position and to a pre-tax income level as shown in table 1.
    - **Irrespectively of their relative performance among all participants the white participants will always be paid more than black participants.**

INFORMATION AFTER STAGE 1
Before voting for a tax level, in stage 2, you will [*not*] be informed about [**which color was assigned to you and your group and about**] your pre-tax income. *You will be informed about you relative performance in your group but you will not know whether you are in the high pre-tax income or low pre-tax income group since you do not know your color.*

- Stage 2: Voting for the tax rate
  - Every person votes on the tax rate s/he wants to apply to the group by choosing a tax rate between 0% and 100%.
  - The median vote will be chosen as the effective tax rate used to determine the post-tax income.

INFORMATION AFTER STAGE 2
After voting for a tax level, in stage 2, you will receive all the feedback information about
- the group and the color which were assigned to you;
- your pre-tax income
- the selected tax rate and
- your post-tax income.

What's Next?

We will ask to answer some control questions in order to check your understanding of the instruction. Once everybody has finished answering the control questions we will start with stage one of the experiment.

If you have any question at any time, just raise your hand and an assistant will come at your desk to answer the questions.